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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/651,877	08/29/2003	Young-Nam Hwang	5649-1148	9355

7590

09/09/2005

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EXAMINER

TRINH, MICHAEL MANH

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 09/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/651,877

Applicant(s)

HWANG ET AL.

Examiner

Michael Trinh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-19,22 and 23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-19,22 and 23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 6/20/05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

*** This office action is in response to Applicant's amendment filed June 23, 2005. Claims 1,20,21,24-36 were canceled. Claims 2-19,22-23

*** The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claim 3 is rejected under 35 U.S.C. 102(e) as being anticipated by Lowrey (6,764,894).

Lowrey teaches a phase-changeable memory cell and method thereof comprising at least: a substrate 12; forming a bottom electrode 22,20 on the substrate 12 (Fig 1; col 2, lines 10-32); forming a phase changeable material layer pattern 28 on the bottom electrode 22,20; and forming a top electrode 30 on the phase changeable material layer pattern 28, the top electrode 30 having a tip that extends toward the bottom electrode 22,20 (Figs 2A-2I; col 2, line 33 through col 3), wherein the bottom electrode 22 is cylindrically cup-shaped (col 2, lines 18-32), and the vertical portion of the bottom electrode extends from an edge of the planar portion of the bottom electrode.

3. Claims 2-19,22-23 are rejected under 35 U.S.C. 102(e) as being anticipated by Casagrande et al (20040012009).

Re base claims 2,3,22, Casagrande teaches a phase-changeable memory cell and method thereof comprising at least: a substrate 11 (Fig 7); forming a bottom electrode 22 on the substrate (Fig 18; paragraphs 57-58); forming a phase changeable material layer pattern 38 on the bottom electrode 22 (Figs 23,25); and forming a top electrode 39,40 on the phase changeable material

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layer pattern 38, the top electrode 39,40 having a tip that extends toward the bottom electrode 22, wherein the bottom electrode 22 has a planar portion and a vertical portion (Fig 18,25), wherein, re further claims 2 and 22, the tip of the top electrode extends toward the vertical portion of the bottom electrode 22 (Fig 25,26A-26B; paragraphs 59-66); and wherein, re further claim 3, the bottom electrode 22 is cylindrically cup-shaped (paragraph 57; Fig 26A-B), and the vertical portion of the bottom electrode extends from an edge of the planar portion of the bottom electrode 22 (Figs 25, 26A-26B). Re base claims 6,13, Casagrande teaches a phase-changeable memory cell and method thereof comprising at least: a substrate 11 (Fig 7); forming a bottom electrode 22 on the substrate (Fig 18), wherein the bottom electrode 22 has a planar portion and a vertical portion (Fig 18,25); a middle insulating layer 48,49 on the substrate and the bottom electrode 22, the middle insulating layer defining a contact hole that exposes at least a part of the vertical portion of the bottom electrode 22 (Figs 25,26A,26B; a phase changeable material layer pattern 38 in the contact hole, the phase changeable material layer pattern 38 having a sidewall portion that extends out of the contact hole and across a portion of the middle interlayer insulating layer 48,49 (Figs 23,25); and a top electrode 39,40 on the phase changeable material layer pattern 38, the top electrode 39,40 having a tip that extends toward the vertical portion of the bottom electrode 22 (Fig 25,26A-26B). Re claim 4, wherein the phase changeable material layer 38 pattern is directly on the bottom electrode 22 (Figs 25,26A-26B).

Re claims 5 and 9, wherein the cell further comprises a lower interlayer insulating layer 18 (Figs 5-7, paragraph 42; Fig 25) between the bottom electrode 22 and the substrate 11; and a contact plug 19 extending through the lower interlayer insulating layer 18 and electrically connecting the substrate 11 with the bottom electrode 22 (Figs 5-7;25). Re claim 7, wherein a spacer pattern 55a between a sidewall of the contact hole and the phase changeable material layer pattern 38 (Figs 21,23,25; paragraphs 61-62). Re claim 8, wherein the bottom electrode 22 is cylindrical, and the vertical portion of the bottom electrode extends from an edge of the planar portion of the bottom electrode, and further comprising a mold layer 23 on the planar portion of the bottom electrode and adjacent to the vertical portion of the bottom electrode, and wherein the middle interlayer insulating layer 48,49 covers the mold layer 23, and the contact hole exposes the mold layer 23 adjacent to the exposed vertical portion of the bottom electrode 22 (Figs 7-

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8,21, paragraphs 44-45; Figs 23-26). Re claim 10, wherein an etch stop layer 48 is between the bottom electrode 22 and the middle interlayer insulating layer 49 (Figs 18-26; paragraphs 58-60). Re claim 11, wherein a shield layer 42 covers a sidewall of the phase changeable material layer pattern 38 (Fig 25, paragraph 65). Re claim 12, wherein a plate electrode 40 on the top electrode 39, wherein the plate electrode 40 is electrically connected to the top electrode 39 (Figs 23,25; paragraph 63). Re claim 23, wherein the method further comprises: forming a middle interlayer insulating layer 49,48 on the bottom electrode 22, wherein the middle interlayer insulating layer defines a contact hole that exposes a part of the bottom electrode 22, and wherein forming a phase changeable material layer 38 on the bottom electrode 22 comprises forming the phase change material layer 38 in the contact hole, the phase changeable material layer 38 having a dented portion protruding toward the bottom electrode 22, and wherein forming a top electrode 39,40 on the phase changeable material 38 comprises forming a conductive layer 39,40 on the phase changeable material layer 38 including the dented portion of the phase changeable material layer 38 (Figs 18,23,25-26; paragraphs 57-66).

Response to Amendment

4. Applicant's remark and amendments with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

** As claim 3 is NOT rewritten in independent form including all of the limitations of the base claim and any intervening claims (i.e. claim 2), amended claim 3 is still anticipated by Lowrey (6,764,894), in which the bottom electrode 22 is cylindrically cup-shaped (col 2, lines 18-32; Fig 2I), wherein the vertical portion of the bottom electrode 22 extends from an edge of the planar portion of the bottom electrode 22.

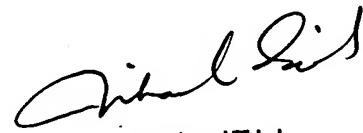
5. The indicated allowability of claims 6-9,2-3 is withdrawn in view of the newly cited reference to Casagrande et al (20040012009). Rejections based on the newly cited reference(s) are as above.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 8:30 Am to 5:00 Pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application should be directed to the receptionist whose telephone number is (703) 308-0956.
Oacs-16-7

A handwritten signature in black ink, appearing to read "Michael Trinh", is written above the printed name.

Michael Trinh
Primary Examiner